4.4 Comparison of a GOES-8 Imager scene to a MODIS scene

There are significant limitations to performing comparisons between GOES-8 Imager and Sounder ST retrievals to land and ocean ground truth data. It is therefore of interest to consider comparisons between GOES skin temperatures and those produced by another satellite. The following section discusses a qualitative comparison between a GOES-8 Imager ST image and a LST image from the 36-channel Moderate Resolution imaging Spectroradiometer (MODIS) instrument.

The MODIS instrument was launched on the Earth Observing System (EOS) Terra spacecraft in December 1999. The MODIS instrument orbits at 705 km in a near-polar, sun-synchronous orbit providing images with swath width of 2330 km with spatial resolution of 250 m (bands1-2), 500 m (bands 3-7), and 1000 m (bands 8-36) (Schueler and Barnes 1998). The MODIS land surface temperature (LST) product used for this comparison is produced by the Institute for Computational Earth System Science (ICESS) at the University of California, Santa Barbara, using a generalized split-window algorithm that utilizes the 1 km data from bands 31 (11 μm) and 32 (12 μm) (Wan 1999). The split-window algorithm is a statistical scheme and uses varying channel emissivity and scan angle dependent coefficients in the LST retrieval process (Wan 1999).

The MODIS LST product is produced at 1 km spatial resolution and considered to have less noise contamination than the GOES ST product, but is only available twice a day. For many regional applications and forecasting studies at GHCC, the GOES satellites are still necessary in order to produce hourly temperatures and tendencies. However, comparisons to the MODIS product may help to improve the GOES products

in the future. Future work may also involve incorporating the one daytime MODIS LST product into the computation of GOES ST tendencies.

The MODIS LST product also contains emissivity values for the two split window channels used to produce the LSTs. These split window channels have wavelengths similar to the GOES channels, and therefore the emissivity values could be used to improve the GOES retrievals by removing the fixed emissivity assumption.

Figures 4.23 and 4.24 provide a qualitative comparison of a MODIS LST scene and a GOES-8 Imager ST scene, respectively, at approximately 1645 UTC on March 5, 2001. The GOES-8 Sounder product was not available at this time. The color temperature scales are similar, but not exactly the same because of the two different software products used to create the images, and a scale on the MODIS color bar was not available. The projection of the two images is also different because the MODIS instrument is on a polar-orbiting satellite, and therefore distortion is seen at the edges of the swath. The MODIS product only contains land temperatures; therefore, all sea, lake and river pixels are white. Future work will possibly involve converting the MODIS data into McIDAS format so that quantitative comparisons can be made.

Notice in Figures 4.23 and 4.24 that the GOES-8 Imager product exhibits similar temperature patterns across the region as the MODIS product, although the spatial resolution of the GOES product limits the amount of detail seen. In addition, the striping of the single pixel resolution retrievals is obvious in the Imager product. However, the patterns and magnitudes of the temperatures of the two products are very similar. Future work incorporating the MODIS LST product will help to improve the GOES products and thus improve the impact of assimilating satellite data into forecast models.

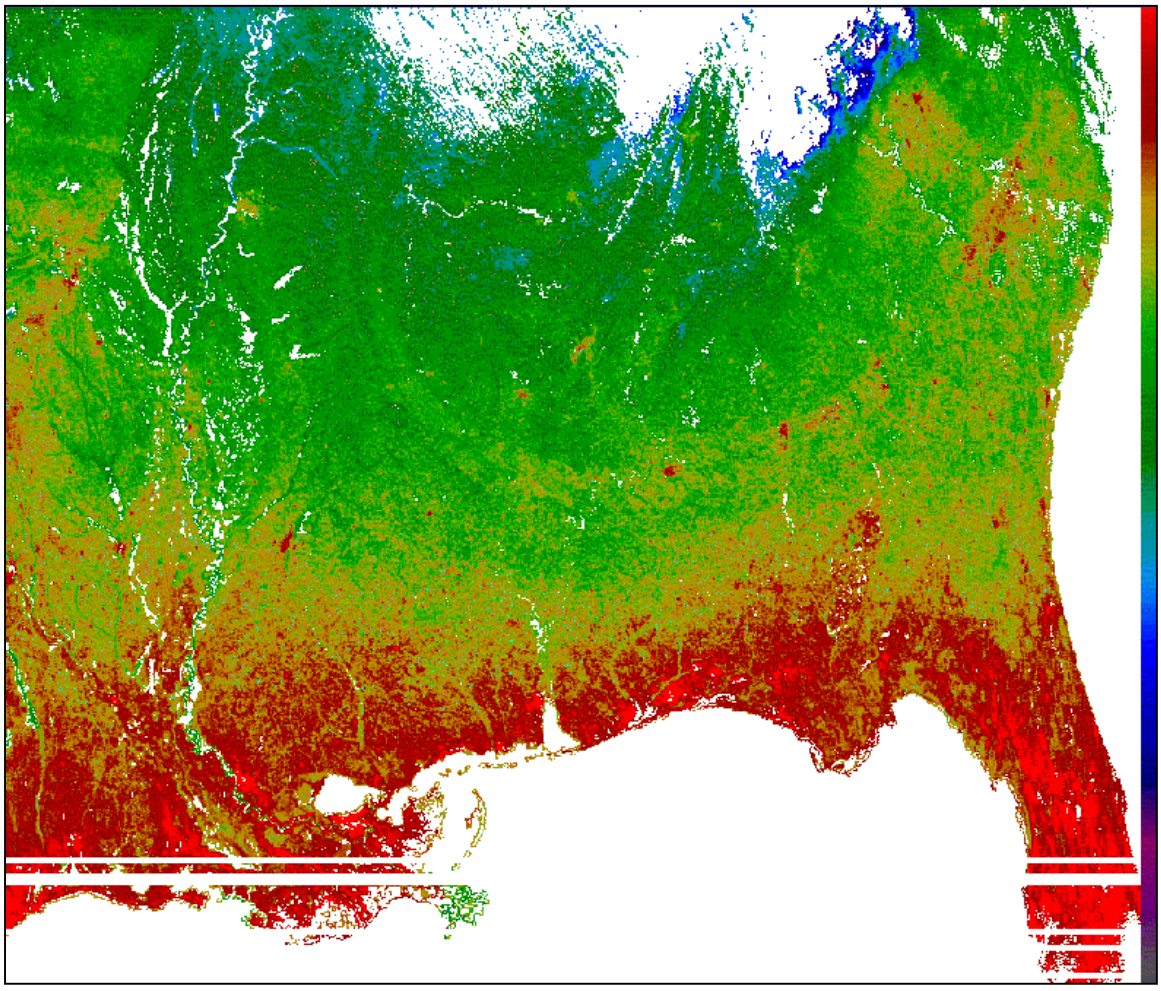

Figure 4.23 MODIS LST image from 5 March 2001 at 1650 UTC.

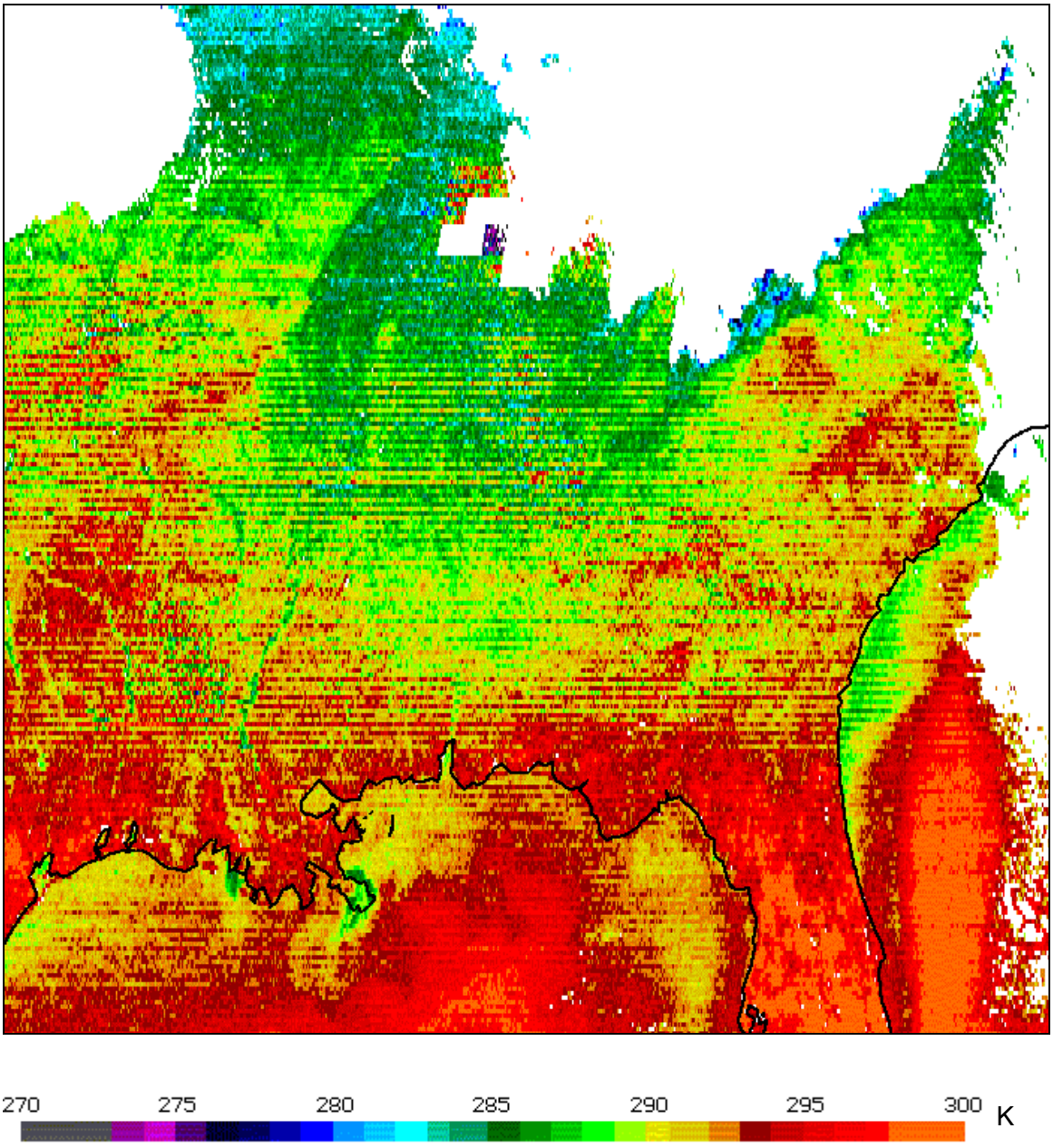

Figure 4.24 GOES-8 Imager ST image from 5 March 2001 at 1645 UTC.